Goddard Procedures and Guidelines

DIRECTIVE NO.	GPG 8700.6	**APPROVED BY Signature:**	*Original Signed by*
EFFECTIVE DATE:	October 16, 2001	**NAME:**	A. V. Diaz
EXPIRATION DATE:	October 16, 2006	**TITLE:**	Director

Responsible Office: 300/Office of System Safety and Mission Assurance, Systems Management Office

Title: Engineering Peer Reviews

PREFACE

P1. PURPOSE

This procedure defines the process for Engineering Peer Reviews of applicable Goddard Space Flight Center (GSFC) products.

P2. APPLICABILITY

This procedure applies to all systems development products within the scope of the GSFC Quality Management System. The EPR process applies to project/product formulation and implementation subprocesses. The formal peer review process defined in this GPG does not apply to sounding rockets, balloons, and aircraft or their associated instruments/payloads. Small Shuttle Payloads (Hitchhiker, Space Experiment Module, and Get-away-Specials) are also excluded. However, product managers for these types of missions shall define and implement an effective peer review process commensurate with the level of risk associated with their specific missions.

P3. AUTHORITY

NPD 8730.3, NASA Quality Management System Policy

P4. REFERENCES

a. NPG 7120.5, NASA Program and Project Processes and Requirements
b. GPG 8730.3, The GSFC Quality Manual
c. GPG 8700.4, Integrated Independent Reviews

P5. CANCELLATIONS

None

P6. RECORDS

Record Title	Record Custodian	Retention
EPR Report including RFA's, RFA Responses, RFA Originator Decisions, and Summary Status of RFA's	Product Manager	NRRS 7/5B1

*FRC: Federal Records Center
**NARA: National Archives and Records Administration

PROCEDURE

1. DEFINITIONS

a. Engineering Peer Review (EPR) - A focused, in-depth technical review that supports the evolving design and development of a product subsystem or discipline area (GPG 8700.6). The purpose of an EPR is to add value and reduce risk through expert knowledge infusion, confirmation of approach, and specific recommendations. An EPR provides a penetrating examination of design, analysis, manufacturing, integration, test and operational details, drawings, processes and data.

b. Engineering Peer Review Plan (EPRP) - A document maintained by the Product Manager that defines the hardware/software products to be reviewed per this procedure and the associated life cycle milestones. The EPRP may take the form of presentation charts provided that the required content is included.

c. Integrated Independent Review (IIR) - One of a series of system-level reviews conducted at critical project/product milestones in accordance with GPG 8700.4. IIR's build upon the results of a robust set of EPR's. The adequacy of the EPR's is assessed at the IIR's.

d. Product - Systems, hardware, software, data, documentation, services, and/or processed material resulting from work activities at GSFC that have been defined to be in-scope for the Quality Management System per GPG 8730.3.

e. Product Design Lead (PDL) - The manager or leader with overall responsibility for managing the product design activity, managing the design and organizational interfaces identified during the design planning, and where required, forming and leading the Product Design Team (PDT). A PDL may be assigned to any directorate and have a title such as Instrument Manager, Subsystem Technical Manager, Integrated Product Development Team Leader, Lead Engineer, Cognizant Engineer, etc.

f. Product Manager (PM) - The individual designated as having management responsibility for a product. A Product Manager may be assigned to any directorate and have a title such as Project Manager, Project Formulation Manager, Instrument Manager, or Principal Investigator.

g. Request for Action (RFA) - A formal written request from the review team, through the review chairperson, that asks for additional information, or an action, of the product design team.

2. IMPLEMENTATION

The Product Manager (PM) shall define and implement a set of Engineering Peer Reviews (EPR's) for the hardware/software subsystems of the product commensurate with the scope, complexity and acceptable risk of the product. The product should be systematically and comprehensively peer reviewed at the individual subsystem level; and at component ("box") and lower levels of assembly, as appropriate. Subsystem and component level design reviews (e.g., Attitude Control Subsystem Critical Design Review (CDR), Reaction Wheel Assembly CDR, etc.) are considered to be EPR's and subject to this procedure. Multiple peer reviews should be conducted, as appropriate, over the lifecycle of each subsystem and component, with content consistent with the evolving design and development.

EPR's should also be used for the focused evaluation of concepts, designs, plans and processes associated with combinations of subsystems and system functions that cross traditional subsystem or discipline boundaries. Examples include maneuver planning and execution; fault detection and correction; the end-to-end data path from detection to data archiving and distribution; or solutions to address, for example, pointing, thermal or contamination constraints.

2.1 Engineering Peer Review Plan (EPRP)

The PM shall initiate discussions with all Product Design Leads (PDL's) early in project/product formulation to identify subsystems, instruments, components, software and crosscutting functional elements to be subject to the Engineering Peer Review (EPR) process. The PM shall prepare an EPRP to document the decisions resulting from these discussions.

The EPRP shall itemize the subsystems, etc. to be reviewed per this procedure and the associated life cycle milestones for the reviews. Any subsystems excepted from the EPR process should be identified, with appropriate rationale. The PM and PDL's should provide the EPRP for line management review, particularly at the Branch Head level. The adequacy of the EPRP is assessed at the system-level Integrated Independent Reviews (IIR's).

2.2 Engineering Peer Review Team

Engineering peer review teams shall be comprised of technical experts with significant practical experience relevant to the technology and requirements of the subsystem, component, etc. to be reviewed. All review team members shall be independent of the project/product team; i.e., not a participant in the project/product team as provider of hardware, software, or analytical, fabrication and other services, and not an immediate supervisor of such a participant. The goal is a thorough, independent review with a variety of perspectives, experiences, and processes considered. Technical experts from outside of GSFC, and other organizations participating in the project, should be included.

A chairperson for each EPR shall be appointed by the PM. The chairperson shall recruit the other members of the review team and should consult with the PDL(s), Branch Head(s), the PM, the IIR Chairperson(s), the Systems Management Office (SMO), or others for potential review team members. Review team members should be selected with consideration of the importance of continuity throughout the product lifecycle to maximize the value to the project/product team.

2.3 Agenda for Engineering Peer Reviews

The PDL shall define the objectives and prepare the agenda for each EPR, with concurrence by the PM and EPR chairperson, prior to the start of each EPR. The Systems Management Office (SMO) web site (http://smo.gsfc.nasa.gov/) includes additional guidelines for EPR's and an EPR checklist that should be considered when formulating the agenda and preparing presentation materials.

The PM shall notify the IIR chairperson(s) of scheduled EPR's for potential participation by an appropriate IIR team member(s).

2.4 Conducting Engineering Peer Reviews

The EPR chairperson presides at the review, moderating question and answer periods and collecting RFA's from review team members and other participants (customers, project/product team members, line management, etc.). The PDL presents review material and directs the presentations by other members of the project/product team in a setting appropriate to the nature, scope and complexity of the subsystem.

The format of an EPR should be selected to maximize the value to the project/product. Potential formats cover a broad range, from a small group examining drawings or test data to speaker/audience forums. The examination of design details is required and subgroup or "splinter" sessions should be conducted, as appropriate. Results of subgroup discussions shall be reported to the chairperson.

At the conclusion of each review the chairperson shall summarize the review team's impressions and review the RFA's for clarification of language and for information to the project/product team.

2.5 Engineering Peer Review Documentation

EPR presentation materials are controlled documents and shall be maintained throughout the project/product lifecycle. These materials represent knowledge that may prove invaluable later.

The EPR chairperson shall compile the findings and RFA's from the review team members, and review them for duplication and clarity. The EPR chairperson shall issue a report, including the summary impression, findings and the complete set of RFA's to the PDL and the PM. This should normally occur within 30 calendar days of the completion of the review. The PM shall provide a copy of the report to the Integrated Independent Review Team (IIRT) chairperson(s).

The PDL is responsible for the implementation/resolution of RFA's and the preparation of responses to the review team. The chairperson and the RFA originator shall review RFA responses for acceptability and inform the PDL and PM of their decisions in writing. The PDL is responsible for reporting RFA status (open, closed, contested) to the PM. The PDL, PM and EPR chairperson shall attempt to resolve any differences of opinion. The PM ultimately directs the PDL in cases of unresolved differences of opinion with the review team. Contested RFA's shall be designated as such in the project database and highlighted for focused discussion at the next IIR.

The EPR report, RFA responses, RFA originator decisions, and the summary status of EPR RFA's are quality records and shall be maintained by the PM throughout the project/product lifecycle. A project's centralized action item tracking system is an excellent vehicle for tracking RFA status.

2.6 Engineering Peer Review Interface with Integrated Independent Reviews

The PM and PDL's shall present a summary of the results of each EPR conducted since the last IIR at the next IIR. The presentation shall include an overview of the EPR process, listing of review team members, findings, summary RFA listing and status, lessons learned, residual risks and mitigation strategies. EPR documentation shall be made available to the IIRT upon request**.**

2.7 Lessons Learned

EPR process lessons learned and best practices may be submitted by any EPR participant to the Deputy Director for Systems Management (Code 300).

Engineering peer review teams shall confirm that project/product teams have queried the NASA Lessons Learned Information System (LLIS, http://llis.nasa.gov) and other knowledge resources, as appropriate, to access relevant past experiences and knowledge that can be leveraged to reduce risk, improve quality and efficiency. Queries should be conducted at the beginning of, and then periodically throughout, the product lifecycle. Review teams should also assist project/product teams in recognizing lessons learned and encourage them to submit their own significant lessons learned to the web-based LLIS in order to make critical knowledge available to other NASA teams as quickly as possible.

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	10/16/01	Initial Release